

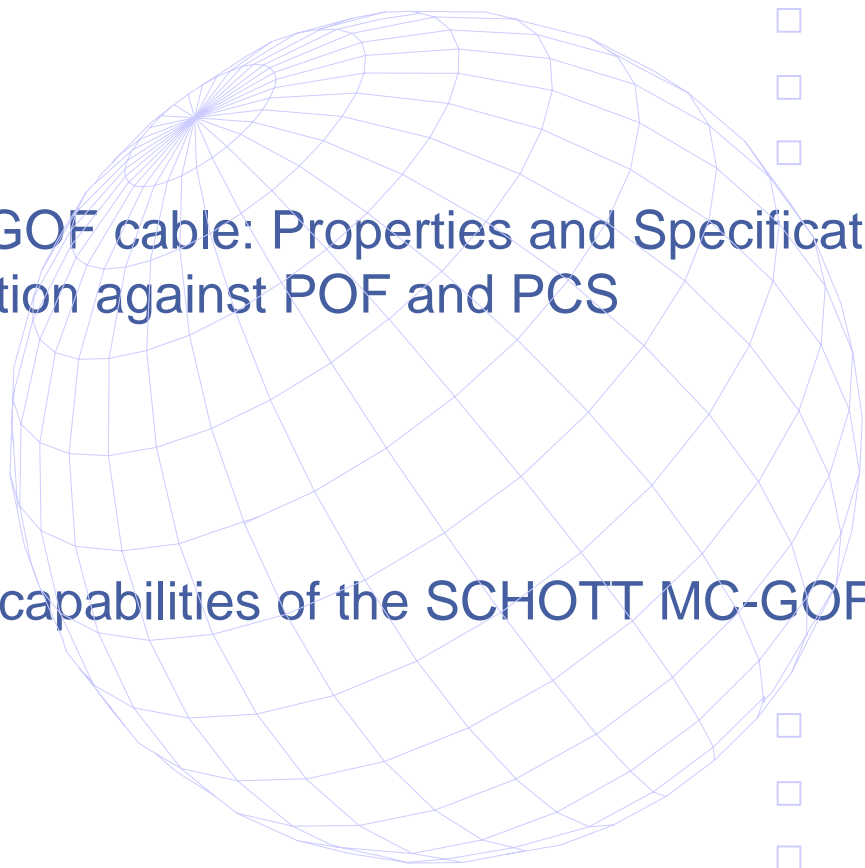
High data rate capabilities of multicore glass optical fiber cables

22. FGT
“Optische Polymerfasern”
2006-10-25

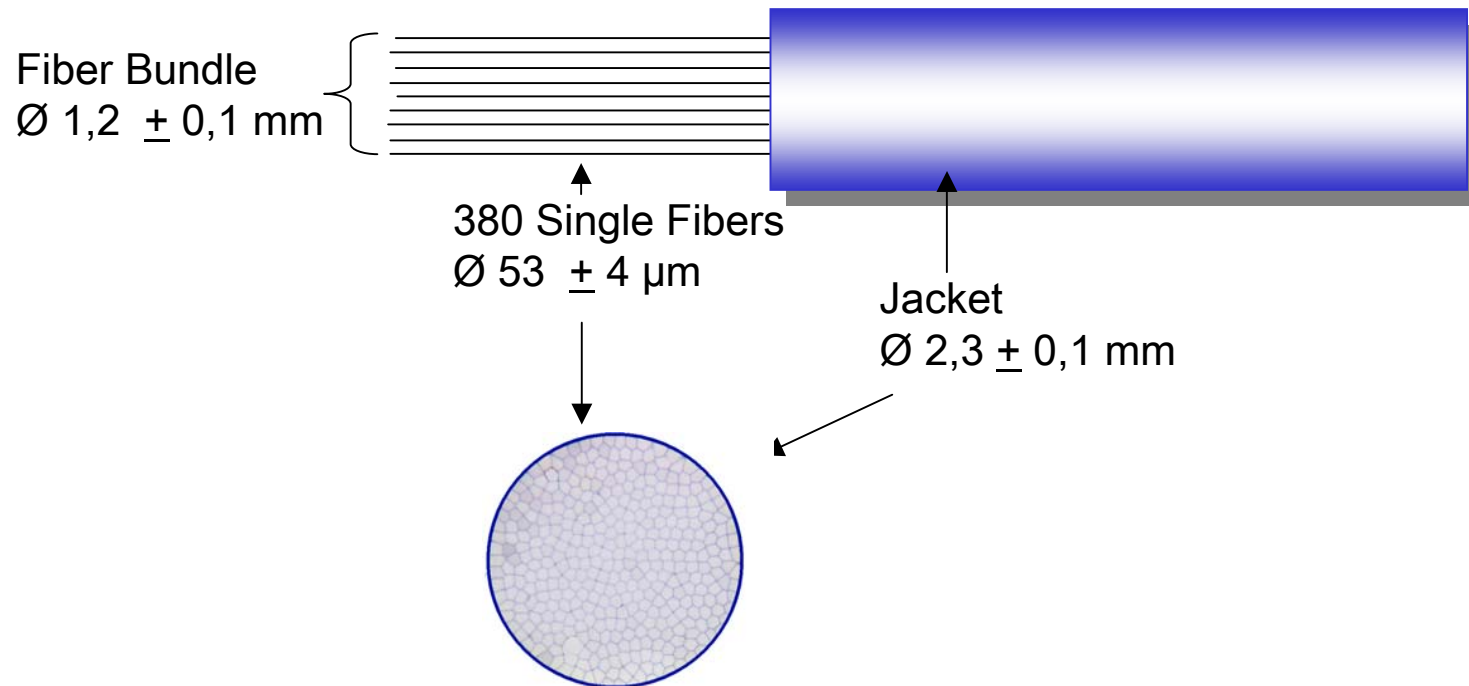
Dr. Werner Sklarek



Agenda topics

- 
- SCHOTT MC-GOF cable: Properties and Specifications and Differentiation against POF and PCS
 - High data rate capabilities of the SCHOTT MC-GOF cable

SCHOTT Multicore Glass Optical Fiber for automotive & industrial applications



The cable fulfils the EC regulation 2000/53/EC („end-of-life vehicle directive)

What is MC-GOF made by SCHOTT ?

- A bundle of single fibers, each of them being a single lightguide with core and cladding!
- Bundled to the needed diameter of the application



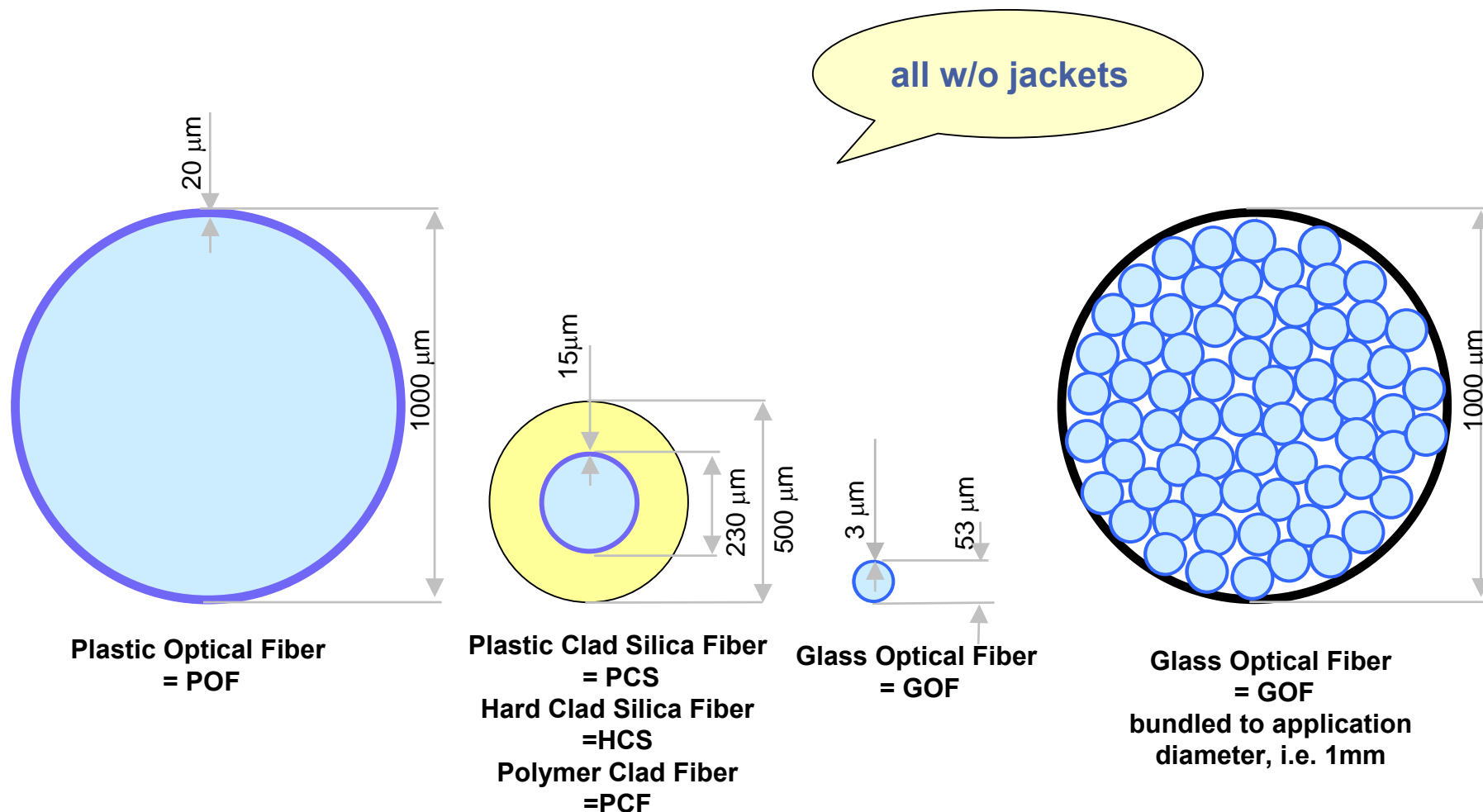
Key benefits of GOF data cable (Glass Optical Fiber)

- Compatibel with 1mm POF fiber (e.g. MOST®, TOSLINK®)
- Robust vs. electromagnetic interference (EMI)
- Temperature resistance from -40°C up to $+125^{\circ}\text{C}$
- Small bending radius (5mm) allows for convenient assembly and integration in wire harness
- Optical attenuation is negligible for distances up to 20m
- High data transmission rates feasible (1 Gbit/s)
- Automotive-proven production technology
- Compliant with end-of-life directive (EU 2000/53/EC)

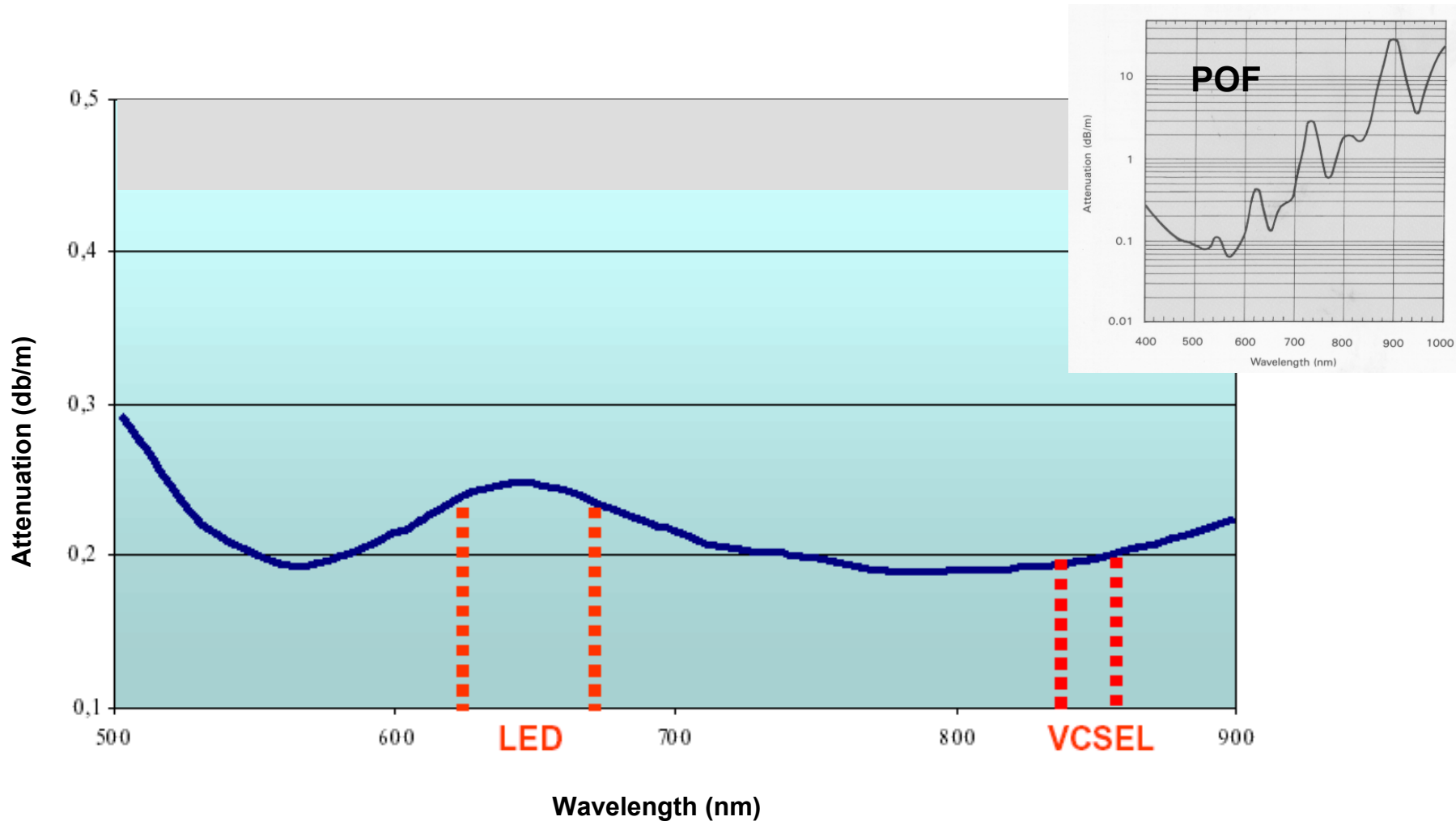


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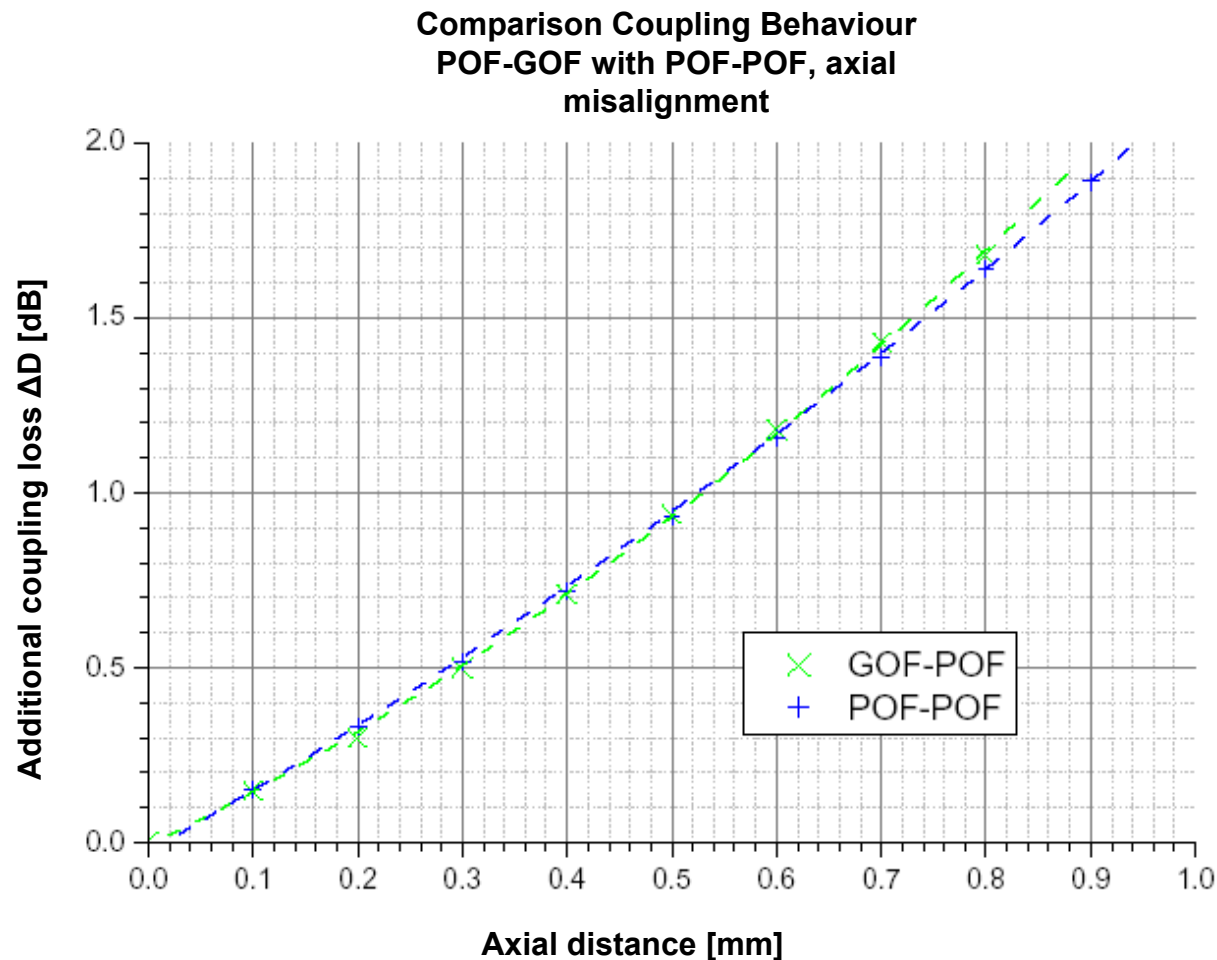
GOF cable allows tolerant coupling



Spectral attenuation G2-Fiber (automotive / datacom)

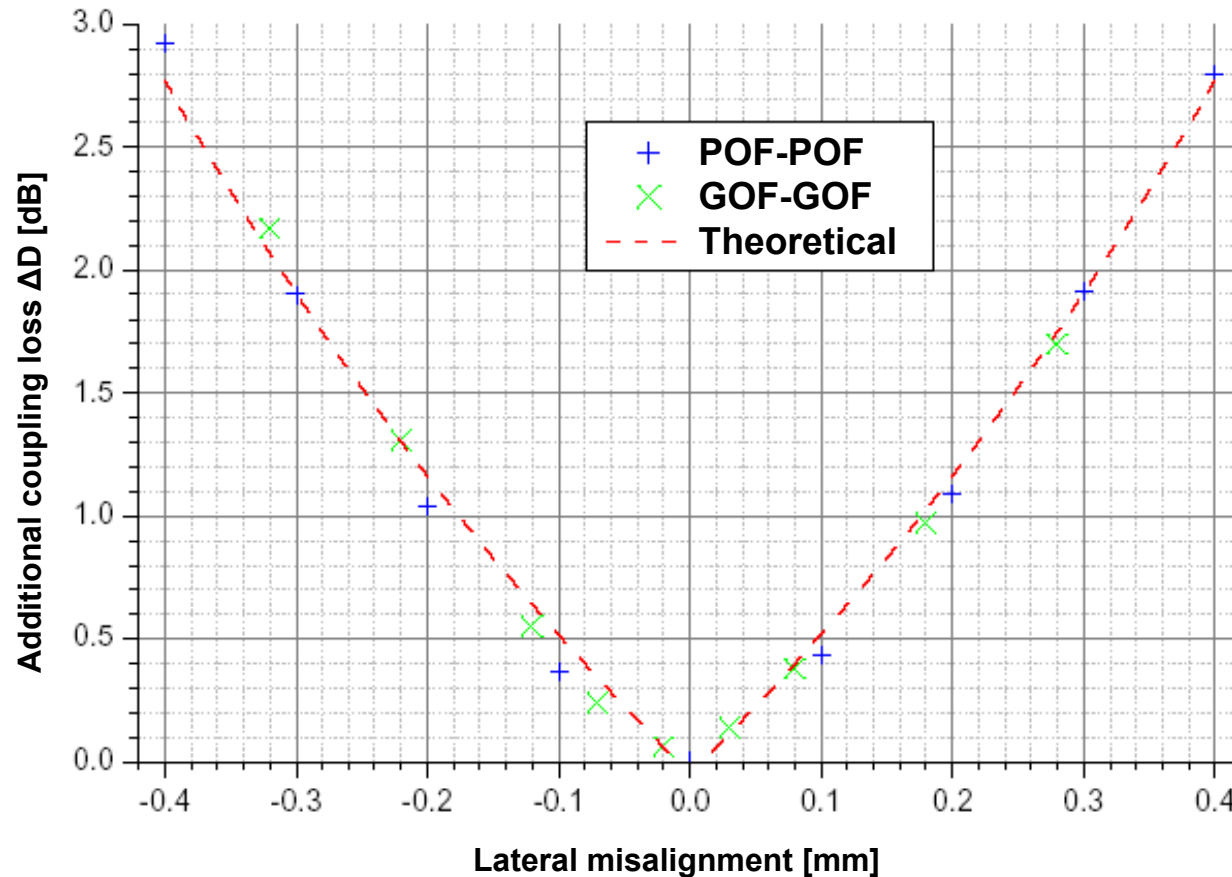


Coupling loss due to axial misalignment – 1mm fiber bundle




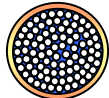

Coupling loss due to lateral misalignment – 1mm fiber bundle

Comparison Coupling Behaviour POF-GOF with POF-POF, lateral misalignment, fiber distance 0.1mm



SCHOTT MC-glassfiber is futureproof - for MOST and “Next Generation Datacom”

- Key property for “Next Generation” is $T_{max} = 125^{\circ}\text{C} \dots 150^{\circ}\text{C}$
- The MC-GOF from SCHOTT is suitable for the temperature Range and the required frequency

Alternative Fiber and Lightsource		
POF  1 mm Ø	GOF  1 mm Ø	PCS  0.2mm Ø
LED	LED	
	VCSEL	VCSEL

MOST

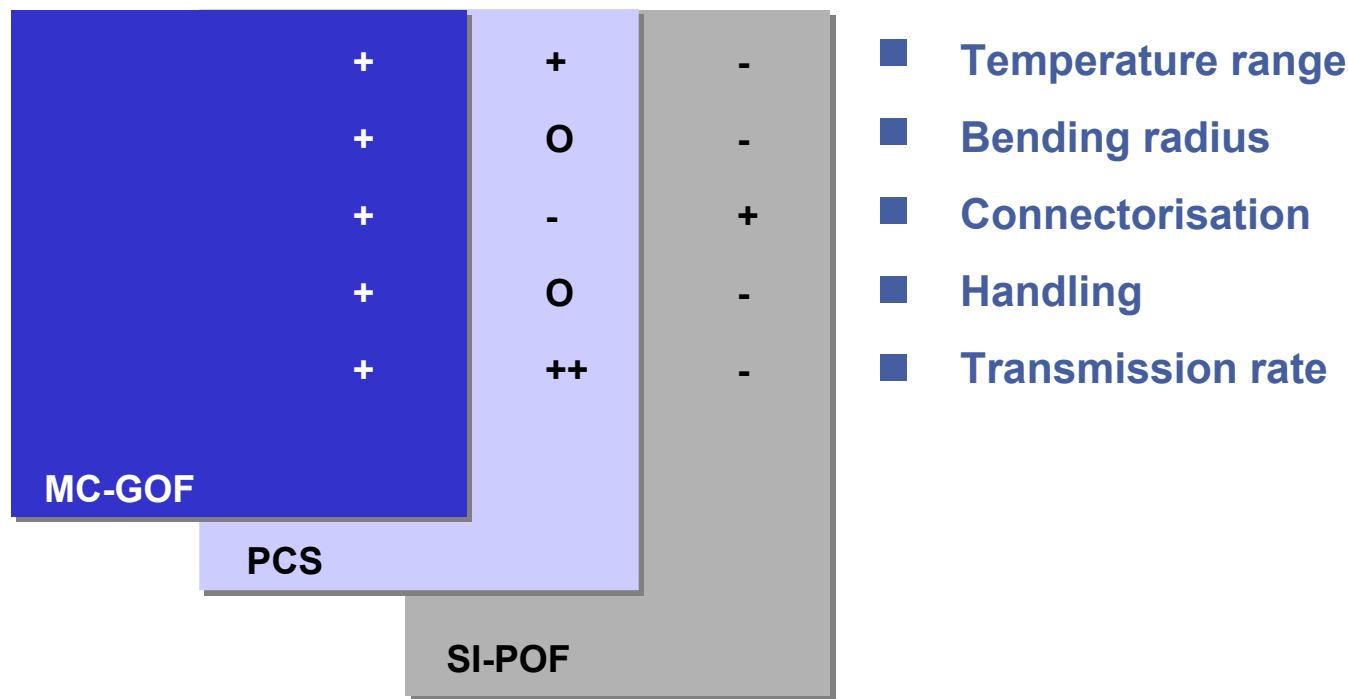
NextGen

POF = plastic optical fiber
GOF = glass optical fiber
PCS = polymer clad silica

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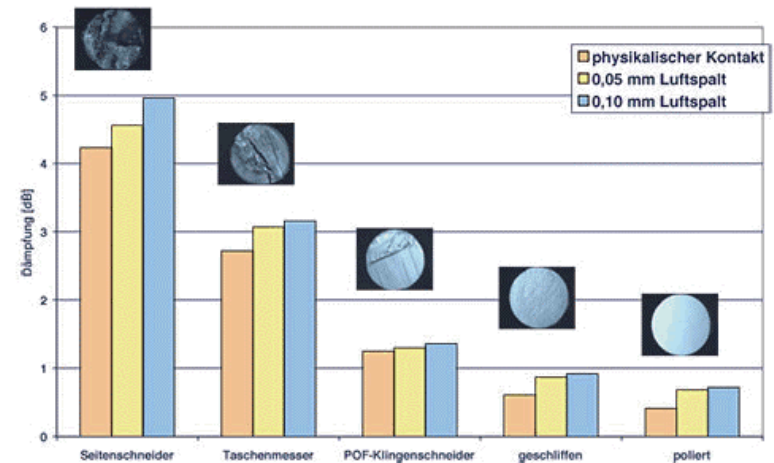
Motivation for MC-GOF – „best of both worlds“

- SCHOTT MC-GOF combines the advantages of copper cables with the advantages of fiberoptic cables



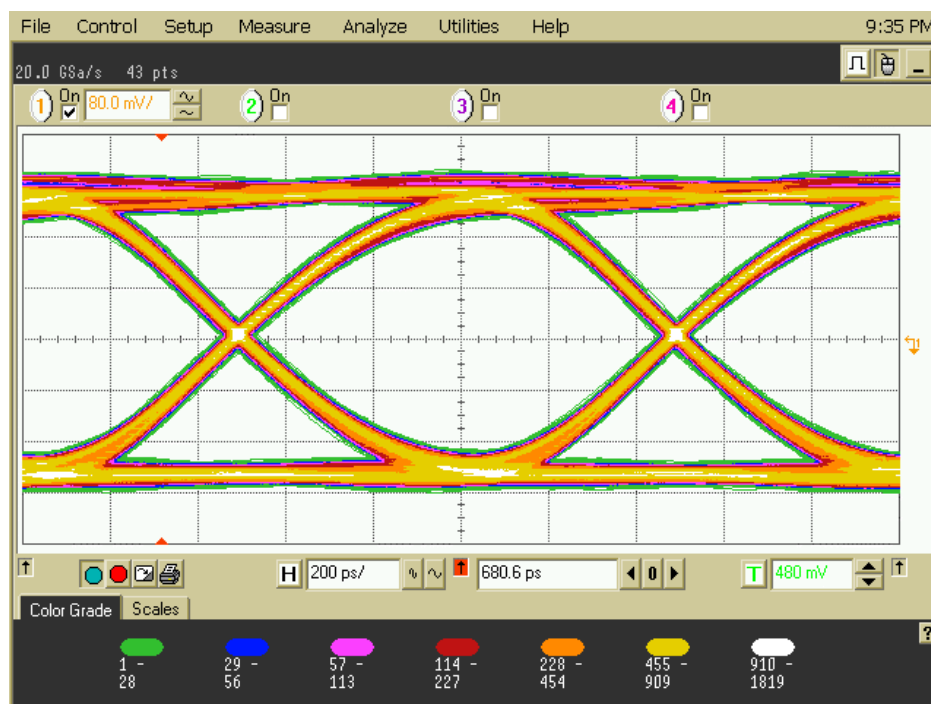
Processing of MC-GOF cables

- Connectors and wire processing for MOST[®] available
- Repair solution for field service available
- Attenuation depends on the quality of the endings similar to POF
- No in situ processing for constant quality, esp. for high data rates



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High datarates tested for SCHOTT MC-GOF



5m @ 1000MBit/s, 850nm VCSEL

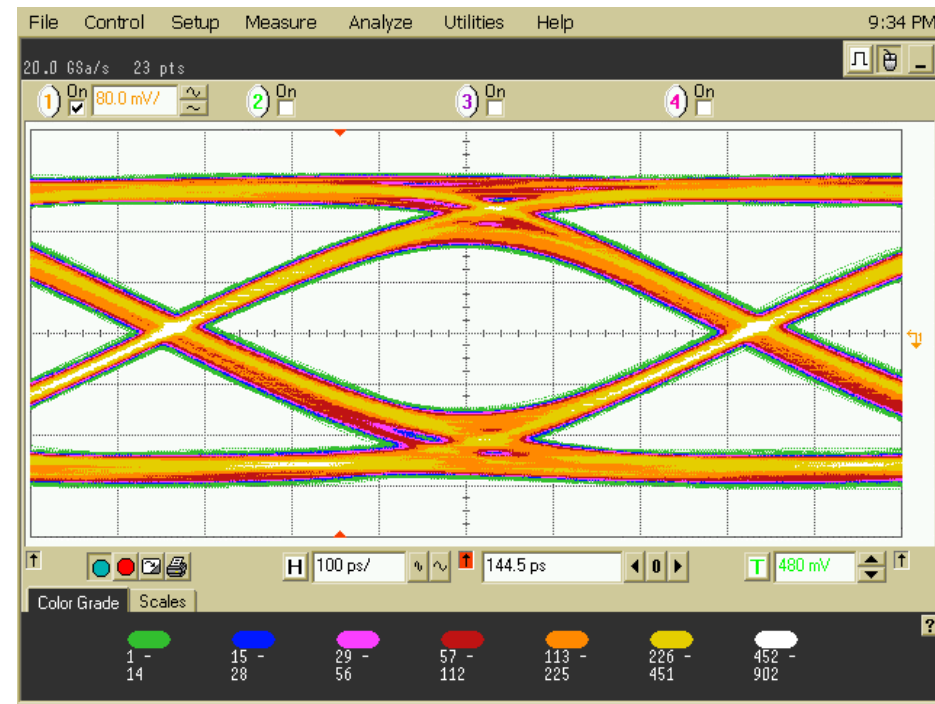
Test results for a system:

VCSEL: ULM photonics Automotive Prototype

Photo-Diode: Hamamatsu, S5052

Fiber: SCHOTT, 1mm

Connector: KOSTAL MOST-Connectors

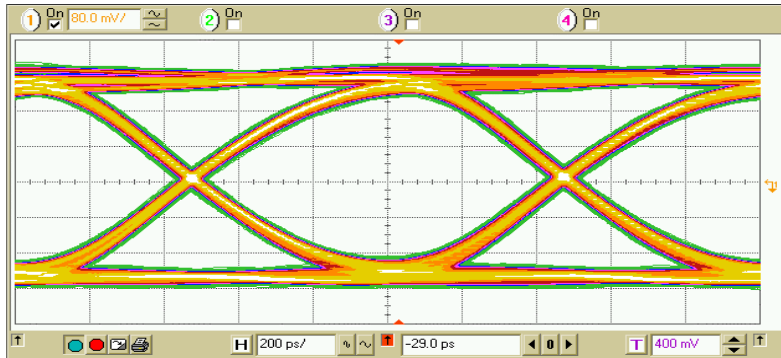


5m @ 1500MBit/s, 850nm VCSEL

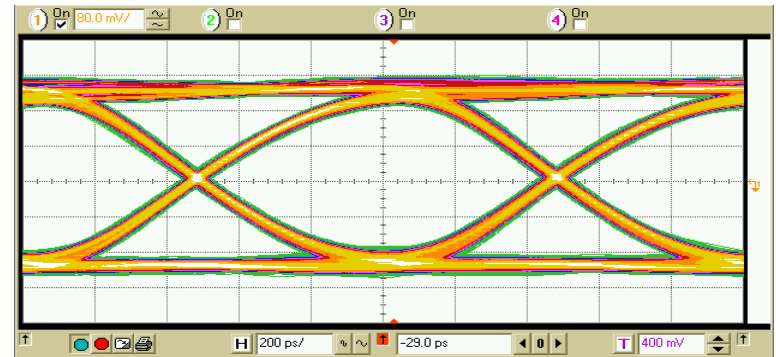
Source: POF-AC, Nürnberg August 2005

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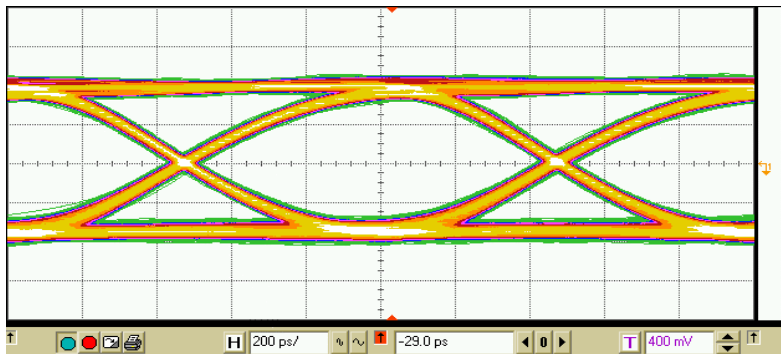
Coupling loss behavior at 1 Gbit/s data rate



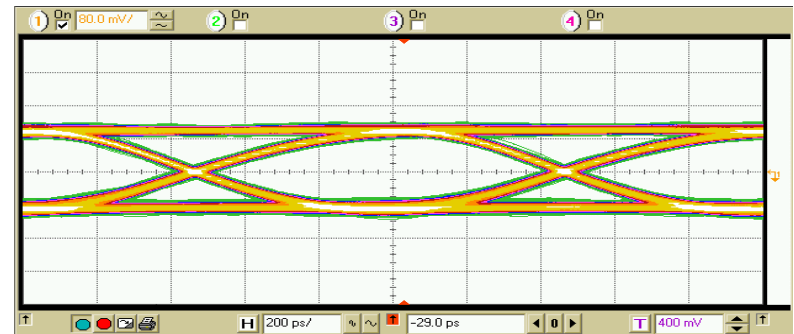
0,46 mm



1,46 mm



2,46 mm



3,46 mm

■ behaves well for different coupling distances

Source: POF-AC, Nürnberg August 2005

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Summary



„ ...Wie die Messungen zeigen, sind Vielkern-Glasfasern für die Übertragung hoher Datenraten über kurze Entfernungen gut geeignet. Bild 11 zeigt die erreichten Datenraten.
Auch über 20 m konnten mehr als 1 Gbit/s erreicht werden. Bei Einfügen von zwei zusätzlichen Steckverbindern sinkt die Bandbreite durch Modenmischung nur leicht. „



Source: POF-AC, Nürnberg August 2005

The World of Fiber Optics

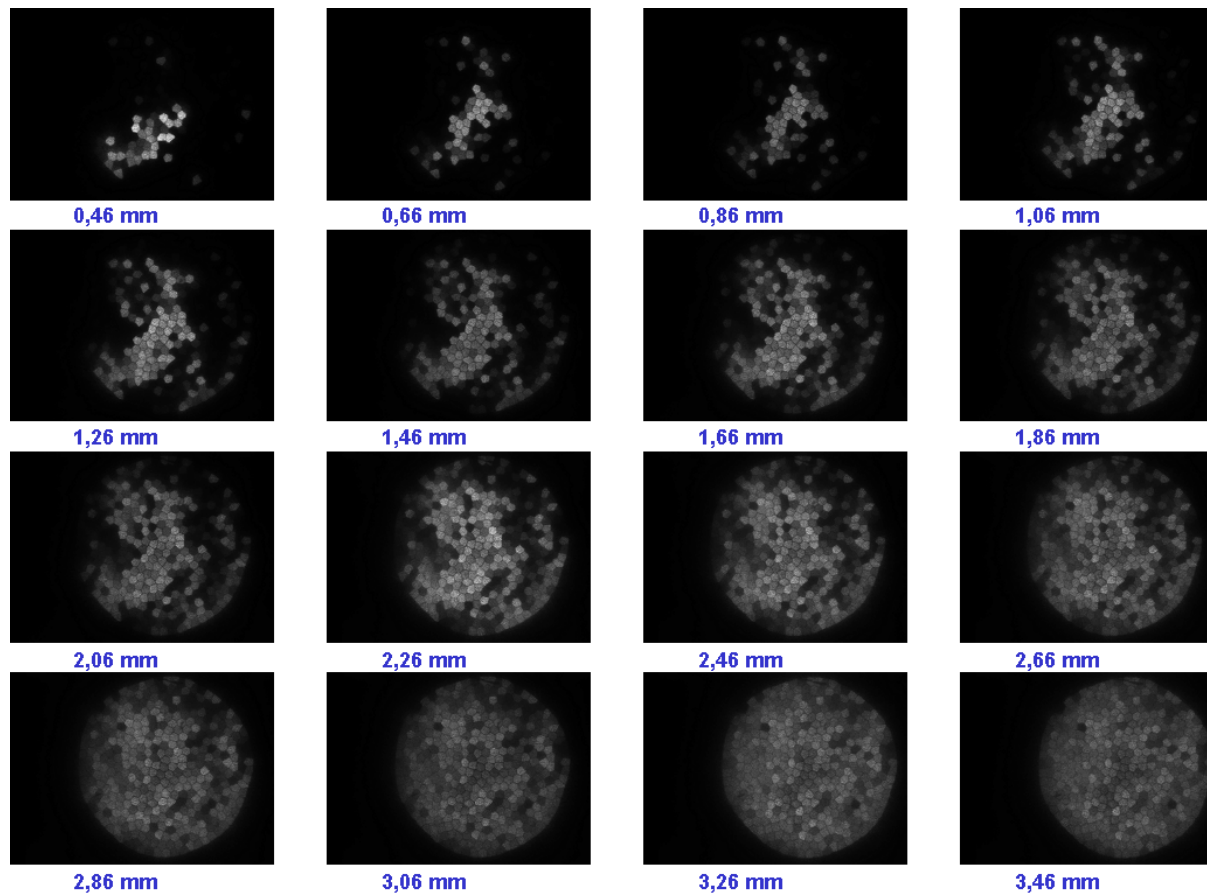
we make things visible



Thank you very much !
 ありがとうございました。

Backup

Near field pictures for different in-coupling distances



Source: POF-AC, Nürnberg August 2005

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Coupling losses



Attenuation of a car lead: X dB



Coupling into a monocoire-fiber (POF → POF, GOF → POF):

Attenuation of ideal coupled leads: X+1,2 dB

Coupling into a multicore-fiber (GOF → GOF, POF → GOF):

Attenuation of ideal coupled leads: X+1,7 dB